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Europäisches Patentamt

European Patent Office

Office européen des brevets



(11) Publication number:

**0 494 323 A1**

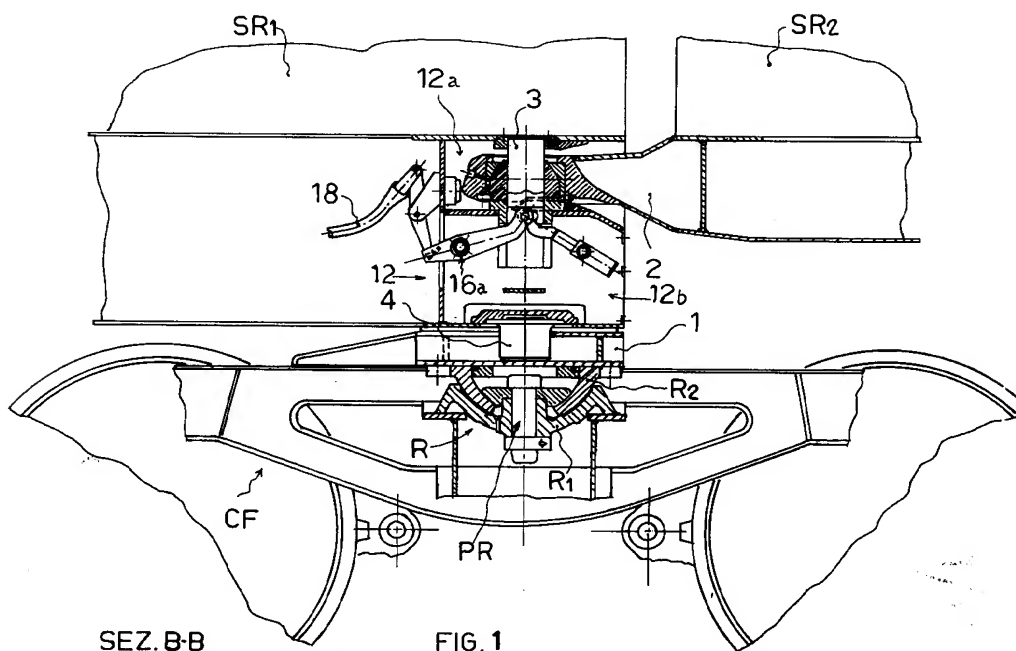
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**EUROPEAN PATENT APPLICATION**(21) Application number: **91100136.0**(51) Int. Cl.<sup>5</sup>: **B61D 3/18, B61D 3/12,  
B61F 3/12**(22) Date of filing: **04.01.91**(43) Date of publication of application:  
**15.07.92 Bulletin 92/29**(84) Designated Contracting States:  
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**I-70126 Bari(IT)**(54) **Coupling and conversion system of bimodal road-rail semi-trailers.**

(57) The invention refers to a new coupling system between bimodal semi-trailers made to function both on road and on rail, and refers to the coupling devices of rail bogies. The coupling, which is of horizontally sliding coupling type, consists in a casing (12) at the rear end of the semi-trailer, into which is inserted a spherical joint (7) at the end of the coupling male member (2) applied to the front end of

the adjoining semi-trailer to be coupled by means of a pin (3).

Moreover, the invention comprises in adaptor cars to apply to the front and rear ends of one or more semi-trailers to permit their insertion into a railway train made up of traditional wagons and also comprises in interconnected safety devices.



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The invention refers to bimodal semi-trailers able to run both on road and on rail.

More in particular it relates to a horizontally sliding coupling device to make up trains of semi-trailers, together with suitable devices to facilitate the application of the rail bogie and of the adaptor bogies then to be applied to the rear and/or front end of a semi-trailer or of a group of semi-trailers when these are to be inserted into a rail way train; the invention also relates to the means suited to coordinating and ensuring the operation of the above mentioned devices.

The coupling together of semi-trailers in order to make up a train of rail wagons can be carried out using either vertical or horizontally connecting devices.

The horizontally sliding connecting devices which apply to this invention consist in a male coupling member furnished with a spherical joint which has a cylindrical vertical hole applied to the front end, and in a fixed casing on the rear cross-beam of the semi-trailer, this being furnished with a cavity into which, after having entered the spherical joint of the male member is linked with a vertical locking pin.

Some of the horizontally connecting devices are built for the simultaneous application of the rail bogie to take place.

A drawback common to all horizontally connecting coupling devices is due to the fact that they are not autocentering, or rather, they do not permit the positioning of the cylindrical hole of the spherical joint to be in exact counter-position to the coupling vertical pin.

Another drawback of the above mentioned devices lies in the fact that, due to the slight difference in height between the coupling casing and the vertical dimension of the end of the same male member, it is thus necessary to carry out accurate manoeuvres by means of the supporting jacks in order to bring the front end of the male member up to the necessary height so allowing its insertion into the coupling casing.

Yet another drawback of the semi-trailers suited to road-rail function is the necessity of means which facilitate a more rapid road-rail conversion and which allow for the automatic insertion of the safety devices.

Some of the existing devices are illustrated in Patents such as: US Patent 4311244, US Patent 4202454, and US Patent 4669391.

The US Patent 4311244 entitled "Automatic coupling to connect convertible rail/road vehicles at their ends", concerns a horizontally connecting device in which a pressure sensitive device, when pressed by the end of the coupling male member mounted on the front end of another semi-trailer, causes the shifting of a pin, which, on penetrating

the cylindrical vertical hole at the end of the same male member, allows for the coupling of the semi-trailers.

In the said device, see fig. 54 of the US Patent, the fixed part 85 of the spherical joint mounted on to the end of the coupling male member, is supported by the ring 86 inserted into the spherical seat 87, it being inserted into the hollow casing at the rear end of the semi-trailer; for this reason, since the moveable part 83 of the spherical joint remains locked by the coupling pin 88, the contact surfaces 85 and 86 of the joint and of the supporting ring respectively and 86 and 87 respectively of the supporting ring and of the spherical seat, which sustain the vertical load transmitted by the coupling male member are subject to sliding and wear and tear during the pitching and rolling motions and/or variations in angulation between the horizontal axes of the semi-trailer.

This constitutes a serious drawback both because the sliding surfaces cannot be sufficiently lubricated and because, after the withdrawal of the male member, the ring support may assume a position which is not coaxial to the axle of the vertical hole where the coupling pin is inserted causing impact on the reinsertion of the end of the male member .

The same happens for the non-automatic coupling device described in the US Patent 4202454 entitled: "Devices for connecting the ends of convertible road/rail vehicles".

Also with the said device, see figures of the US Patent, the pitching and the rolling motions cause sliding between the supporting ring 237 of the coupling male member and the fixed part 335 of the spherical joint mounted on the end of the same coupling male member; in fact, the pitching and rolling motions cause the shifting of element 335 of the spherical joint, in relation to element 334 rigidly attached to the pin 88, along the spherical contact surface and consequently, the sliding of the fixed part 335 of the spherical joint on the opposite surface of the supporting ring 237 mounted on the rear end of the semi-trailer.

In other coupling devices, such as those described in the US Patent 4669391 entitled: "Train formed by road semi trailers", the coupling member 206, see figure 9 of the US Patent, contacts directly on an elastomere supporting ring 286, making the component part of the coupling male member rigidly attached to the rear end of the other semi-trailer, without using either a spherical joint which distributes the dynamic tractive stress to a more extensive surface, or means which impede the sliding of the end of the male member on the support 286: the tractive efforts are transmitted to the male member 206 of the pin 288, which in consequence, is subject to shearing stress.

In another embodiment of the coupling device described in the same above mentioned Patent, see figure 5, the male member 24 is furnished with a spherical joint 64 which enters exactly into the casing body 44 at the rear end of the other semi-trailer, so as to be contained between its upper and lower horizontal inner surfaces thus avoiding the sliding of the end of the male member against the abovementioned inner surfaces caused by the pitching and rolling motions.

One main object of the present invention is to provide a coupling device which enhances the functioning of the horizontally sliding coupling devices described in the above mentioned patents, and which at the same time eliminates any drawbacks.

Another main object is to combine a horizontally sliding coupling device of bimodal road-rail semi-trailers with a rail bogie coupling device, of the pin-fifth wheel type.

Yet another object is that of rendering the mechanical interconnecting means of the coupling devices interdependent with those of the coupling devices of the rail bogie and of the wheels of the road bogie above the level of the rails, after the coupling of the same rail bogie.

Finally yet another aim is that of supplying rail bogies mounted with buffers and traditional coupling systems to be applied to the front end of one or more semi-trailers to allow for their insertion into a normal rail train, making use of the horizontally sliding coupling devices of semi-trailers in order that the bogie be applied to the front end, and for the one to be applied at the rear end, making use of a pin-fifth wheel device the same as that used by the rail bogie.

For these purposes the invention resolves the following problems:

- a) The autocentering of the end of the coupling male member corresponding to the axis of the coupling pin, without the occurrence of recoils.
- b) The distribution of the vertical load transmitted from the coupling male member through the lubricated surfaces in counter position to the hollow casing and of the spherical casing which form the spherical joint, so as to reduce to zero the friction between the above mentioned surfaces.
- c) Automatic lifting of the wheel axles of the road bogie caused by the insertion of the rail bogie.
- d) Interdependence between the coupling systems of the semi-trailers and those which ensure the locking of the rail bogie and the lifting and coupling of the wheels of the road bogie.

The invention is subsequently described in detail in the following pages and illustrated by the figures of the 11 sheets enclosed which are sup-

plied respectively in this way:

fig. 1, the cross section BB of fig. 5 passing through the axes of the locking pin of the rail bogie and the coupling male member between the semi-trailer;

fig. 2, the cross-section A-A of fig. 5 passing through the axis of one of the forks which lock the turn plate applied to the rail bogie;

fig. 3, a view from above of the pivoting turn plate of the rail bogie and of the means which allow for its locking to the semi-trailer;

fig. 4, the two positions assumed by the turn plate of the rail bogie;

fig. 5, the section of the rear cross-beam of the semi-trailer passing through the axes of the coupling pins of the semi-trailers and of the rail bogie;

fig. 6, a view from above of the opposite ends of the two semi-trailers showing particulars of both the coupling and the safety systems;

fig. 7, the longitudinal section particularized by the horizontally sliding coupling device;

fig. 8, the anti-telescoping back girder;

fig. 9, a section of fig. 8 in which one can note the end stroke devices actioned by the anti-telescoping back girder and by the bolt which locks the hook that fastens the turn plate to the pin of the semi-trailer;

fig. 10, the sections x-x, y-y and z-z of fig. 6 corresponding to both the coupling and the safety means;

fig. 11, the lever system which activates the coupling of the semi-trailers and which locks the wheel axles of the road bogie, above the level of the rails, before the insertion of the rail bogie and the coupling of the semi-trailers;

fig. 12, the levers of fig. 11, after the coupling of the semi-trailers and the insertion of the rail bogie, as they lock the wheels of the road bogie above the level of the rails;

fig. 13, the front adaptor bogie applied with the horizontally sliding coupling device;

fig. 14, view from above of the front end of the front adaptor bogie;

fig. 15, the rear adaptor bogie;

fig. 16, the rear bogie viewed from above.

The device which permits the mounting of the rail bogie CF to the rear end SR1 of the semi-trailer consists in, see figures 1,2,3 in a special plate 1, which in the present description is also named turn plate, furnished with a V-shaped groove V 1b, edged with guide wings 1a, these also being positioned downwards, the turn plate being rigidly attached to a counter fifth wheel R2 which is inserted into the fifth wheel R1 of the bogie; the coupling of the fifth wheel pin-counter fifth wheel is rendered stable by the pin PR furnished with a locking nut.

The application of the turn plate 1 of the bogie

CF is carried out, see fig. 3, by inserting a king pin 4, below the base of the coupling casing 12, into the triangular aperture 1b and its locking with a hook 38 kept in a closed position by a bolt 38a; the turn plate is further locked by two forks 5 which are inserted into two tubular cavities 5a in the cross-beam SR1T, including the same coupling casing 12.

The bolt is actioned by a bar 38b manoeuvred by a handle 38d which remains in the unlocked hooking position, when the notch 38c is inserted into the lateral edge of the same turn plate.

The turn plate can rotate 180, around the axis of the pin PR of the fifth-wheel pin of the bogie, to permit the coupling of the bogie, to the semi-trailer, from both ends. For this, the pin 36 which blocks the turn plate to the bogie by means of two small plates 1c is extracted from the axle box 37 of the bogie; as already described in Patent No. 1220241 of the same Ferrosud, the small plates 1c rigidly attached to the turn plate 1 are distanced in order to allow for slight angular shiftings of the same turn plate, for example of  $5^\circ \pm$  around the axis of the pin PR, in order to facilitate both the coupling of the bogie of the semi-trailer, and small rotations of the bogie in relation to king pin 4 of the semi-trailer.

The horizontally sliding coupling device of the semi-trailers consists in a male member which at one end incorporates a spherical joint formed by a semi-spherical hollow 6 rigidly fixed to it, into which is inserted, with a moveable connection, a semi-spherical part 7, furnished with a cylindrical hole 7c, into which enters the cylindrical coupling pin.

The contact surfaces 6b and 7b, fig. 7, are easily lubricated, for example by means of grooves so that the hollow casing 6 and the semi-spherical part 7 which form the joint, may slide on each other causing the minimum of friction, during the shifting of the male member in relation to the coupling pin 3 rigidly attached to the semi-spherical part 7, which is caused by the motions of the vehicles.

The end of the male member enters the cavity 12a of the coupling casing 12 and then rests with the flat surface 7a of the semi-spherical part, on a ring-shaped support 8, this also forming a flat ring-shaped support base 8a.

This happens when the edges of the coupling male member, after having surpassed the edges 2-1, 2-2, 2-3 of the metal ring which includes the spherical part 7 (see fig. 7 and fig. 10) the surfaces 13-1, 13-2, 13-3 of the semi-ring shaped support, causes with an up down motion and without sliding, the overlapping of the ring-shaped surfaces 7a with the ring-shaped surface 8a of the support 8.

The introduction of the end of the male member into the coupling casing is facilitated by the angled surface 13/1 forming a rising incline on

which runs the contour 2/1 of the metal ring.

On centering the ring-shaped surface 7a on the support surface 8a, two lateral wedges 13d, come together, the stop buffer 13a and the opposite contours 13/3 of the support surfaces and 2/4 of the metal ring which includes the spherical part 7 (fig. 7 and fig. 10 section x-x).

The centering is considered completed when corner 2/3 of the metal ring at the end of the male member surpasses corner 13/4 and then counter-positions itself with the face 2/4 to the surface 13/3 of the incline.

When the pin 3 establishes connection penetrating the cylindrical vertical hole 7c, the opposite surfaces of the lower edges of the metal ring and of the incline 13, respectively 2/4 and 13/3 and 2/5 and 13/2, remain distanced by an air gap  $t$  since entering oppositely, the opposite surfaces 7a of the spherical part, and 8a of the ring-shaped support 8, they impede further downward shifting of the metal ring.

The air gap  $t$  (fig. 3) must be such that, once the couplings have been completed, during the movement of the vehicles, the said surfaces cannot come into reciprocal contact and so cause sliding.

The compression force is concentrated solely on the opposing surfaces 7a and 8a respectively, of the spherical part 7 and of the metal ring 8: the shifting of the male member in relation to the coupling pin 3 causes only reciprocal shifting between the surfaces 6b and 7b respectively, of the hollow casing 6 and of the part 7 which form the spherical joint.

The pneumatic implant which causes the elevation of the rear part of the semi-trailer to allow for the insertion of the rail bogie, comprises of an end stroke valve 30 which the anti-telescoping back girder A1 actions when it is completely rotated upwards.

The said end stroke valve inserts the valves which cause, by re-inflating the cylinders of the pneumatic suspension of the road bogie, the elevation of the semi-trailer: the maximum height of the elevation is pre-determined by another end stroke valve.

The necessity to elevate the end of the semi-trailer with the suspension of the road bogie, is due to the fact that, with the rail bogie CF, the platform of the semi-trailer travels at a greater height than it would on the road; only in this way, by the pneumatic cylinders 24, can the wheels of the road bogie be elevated by about 25cm above the level of the rails.

The elevation of the wheels of the road bogie above the level of the rails takes place immediately after the insertion of the rail bogie; this is provided for by the end stroke valve 31 actioned by the bolt 38 of the hook which locks the turn plate 1 of the

rail bogie to the semi-trailer, which by means of a pneumatic valve deviates the air which feeds the cylinders of the pneumatic suspension, into the above mentioned cylinders 24.

The axles of the road wheels are locked in a maximum elevated position by hooks 25 which are slipped into the eyelets 27a of the male members 27 connected to the same axles; the hooks are actioned at the same time by a bar 23 by a lever 21 motioned by a spring 22 which via the compound lever 19, causes the simultaneous insertion of two pins 9 mounted inside the cylindrical vertical holes 19a of the rear beam TR of the semi-trailer into the corresponding holes 9a of the turn plate 1 of the rail bogie, ensuring its definitive locking.

Non-occurrence of the insertion of the hooks 25 after the application of the rail bogie and the subsequent elevation of the wheels of the road bogie, causes, in the event of the breaking of the coupling male member, the braking of the semi-trailer.

Braking may also be caused by the safety device 11, rather than the breaking of the tubes which connect the implants of more semi-trailers coupled together.

The movements of the bar 23 which actions the hooks 25 and those of the pins 9 which ensure the locking at the turn plate of the rail bogie are conditioned by the levers which activate pin 3 which locks the coupling male member 2.

In fact the movements of the bar (23) may be carried out only after having caused, by means of lever 16c, the elevation of pin 3: with this is caused the rotation of the lever 16 and with it that of the small plate 16b which impedes the rotation of the lever 17 connected by bar 18 to bar 23.

After the coupling of the wheels of the road bogie and the rotation of the hand lever 17 the latter assumes such a position as to impede the clockwise rotation of hand lever 16c thus the extraction of coupling pin 3; such a manoeuvre may only be carried out after having caused, with the extraction of the hooks 25 which ensure the elevation of the wheels of the road bogie, the anticlockwise rotation of the hand lever 17.

During the motion on rail, pin 3 is always in a coupling position because it is presumed that the semi-trailer must always be connected to another semi-trailer or to the rear adaptor bogie.

In fact, to permit the insertion of the semi-trailers in a rail-road convoy of traditional cars, the invention has provided for two adaptor bogies to be applied to the front part and to the rear part respectively, of each semi-trailer, and being mounted with buffers and with traditional coupling devices.

The front adaptor bogie is furnished with a cross beam 32 applied to the fifth wheel of a rail bogie to which are rigidly attached the frame

members 32a and 32b, the first ones being mounted with buffers and traditional coupling devices, the second ones terminating in angled edges 32c to facilitate the introduction below platform to the front end of the semi-trailer SR2.

The cross beam 32 is mounted in the centre part, of the coupling casing 12bis the same as the one mounted on the end of each semi-trailer, into which the spherical joint of the male member 2 is inserted, and into which the coupling pin 3bis penetrates sliding into the cylinder 15bis.

The locking of the front adaptor bogie is made definitive by two lateral plates 33 rigidly attached to the front end of the frame members of the semi-trailer, into which the wings of the double T - shaped beam (H-beam) are inserted and which form the two frame members of the adaptor bogie. The rear adaptor bogie illustrated in figure 15 differs from the rail bogie solely in the application to the turn plate 34a of two frame members 34/1 on one part, and two frame members 34/2 on the opposite part, these latter ones being mounted with buffers R and with the coupling device for traditional cars.

In order to facilitate the introduction below platform of the semi-trailer, the frame member 34/1 of the rear adaptor bogie have the ends shaped in such a way as to form angled surfaces 34b: king pin 4 of the semi-trailer is guided into the triangular opening 1b of the V-shaped plates 1a as is the case in simple rail bogies.

The aim of the plates 35 rigidly attached to the rear ends of the two frame members of the semi-trailer is to make the adaptor bogie definitively rigidly attached to the semi-trailer.

## Claims

1. "Coupling and conversion system of bimodal road/rail semi-trailers", characterised by the combination of the following parts:

- a) - a horizontally sliding coupling device between the semi-trailers, formed by a male member (2) applied to the front end and by a coupling casing (12) rigidly attached to the rear cross bar of the frame of the semi-trailer, and into which the end of the male member is coupled, by means of a pin (3) operated by levers, the said male member being for this purpose mounted with an articulated spherical joint with a cylindrical vertical hole;
- b) - the means of application of the rail bogie to the rear end of the semi-trailer, consisting in a turn plate (1) applied with a fifth wheel to the same bogie, and in a king pin (4) applied to the rear cross bar of the frame of the semi-trailer;
- c) pneumatic devices in order to cause the

elevation of the platform of the semi-trailer with the wheels of the road bogie, after the upwards rotation of the anti-telescoping back girder;

- d) - mechanical/pneumatic devices to allow for the elevation and coupling of the wheels of the road bogie above the level of the rails, interconnected to the duct of the rail brakes and mechanically to the coupling pin (3) of the male member (2) in order to prevent uncoupling;
- e) - means coordinated to ensure the coupling of the rail bogie, the coupling of the semi-trailer, and the coupling in a raised position of the wheels of the road bogie;
- f) - means to permit the insertion of one or more semi-trailers in a train made up of conventional vehicles, consisting in a front adaptor bogie applied with the same above mentioned coupling male member (2) in a rear adaptor bogie applied by the same means to the rail bogie CF;
- g) - interconnected mechanical and pneumatic means, to prepare for, in a logical sequence, the functioning on rail and to carry out the reciprocal coupling.

2. System as claimed in claim 1, in which the coupling device which in point a) is characterised by:

an angled surface (13.1) rigidly attached to the base of the coupling casing (12) and a vertically angled contour (2.1) at the end of the coupling male member to facilitate the sliding on the same above mentioned contour, the necessary height of the section (12a) of the coupling casing (12) being greater than the vertical dimension of the end of the same coupling male member to permit the necessary vertical shifting;

- two lateral and horizontal wedges (13d) for the positioning of the longitudinal axis of the male member (2) in the longitudinal centre line of the coupling casing (12); the perimetral contour of the lower edge of the metal ring into which the articulated spherical joint is inserted this being in turn characterised by a first vertically angled contour (2.1), by a flat part (2.2) and by a second vertically angled contour (2.4) in such a way as to form a clasping when the end of the male member, after having surpassed the angled surface (13.1) and the flat surface (13.2) of the semi-ringshaped support with its end slides downwards along the vertically angled contour (13.3) with the edge (2.3) preventing the recoil of the male

member and further sliding of the same above mentioned male member into section (12a) of the coupling casing, being stopped by the cushion pad (13a);

- a ringshaped support (8) with the outer diameter of the supporting surface less than or almost the same as the outer diameter of the spherical part (7), or rather less than the inner diameter of the circular edge of the metal ring at the end of the male member (2), the inner diameter of the above mentioned support (8) being equal to that of the cylindrical vertical hole (7c) in the spherical part (7), the same above mentioned part into which the coupling pin (3) must penetrate, the support (8) being rigidly attached to the base of the casing (12a) and concentric to the inner semicircular contour of the semi-ringshaped surface (13) on which the lower contour of the metal ring at the end of the male member must slide, the fixed part (6) being inserted and being rigidly fixed in the metal ring at the end of the male member, and the spherical part (7) of the spherical joint which is coupled to the coupling pin (3) being inserted in the part (6), the support of the spherical part (7) occurring solely between the lower surface (7a) and the support ring (8), the overlapping of the lower surface (7a) on the support surface (8a) occurring only after the edge of the metal ring of the coupling male member (2) surpasses the edge (13.4) of the semi-ringshaped access surface.

3. System as claimed in claim 2, characterised in that between the edges (2.4) and (2.5) of the metal ring of the male member (2) and the surfaces (13.3) and (13.2) of the access surface, forms an air gap (t) which prevents sliding, during the pitching and rolling and rotation motions, between the same metal ring and the surfaces (13), as soon as the spherical part (7) of the spherical joint then rests itself concentrically on the ringshaped support (8), the ringshaped support having sufficient vertical width to form an air gap (t) when the ring shaped surface (7a) of the spherical part (7) rests on the surface (8a).
4. System claimed as in claims 1, 2 and 3, characterised by the fact that the means which permit the vertical shifting of the pin (3) consist in a lever (16) operated by a hand lever (16c) and that the pin (3) is kept in coupling position

by a compressed elastic device (14), and that the lowering of the pin is prevented by a hand lever (17) with the fulcrum at point (17a) which locks the small plate (16b) of the lever (16) if the wheels of the road bogie are elevated and locked in that position by hooks (25).

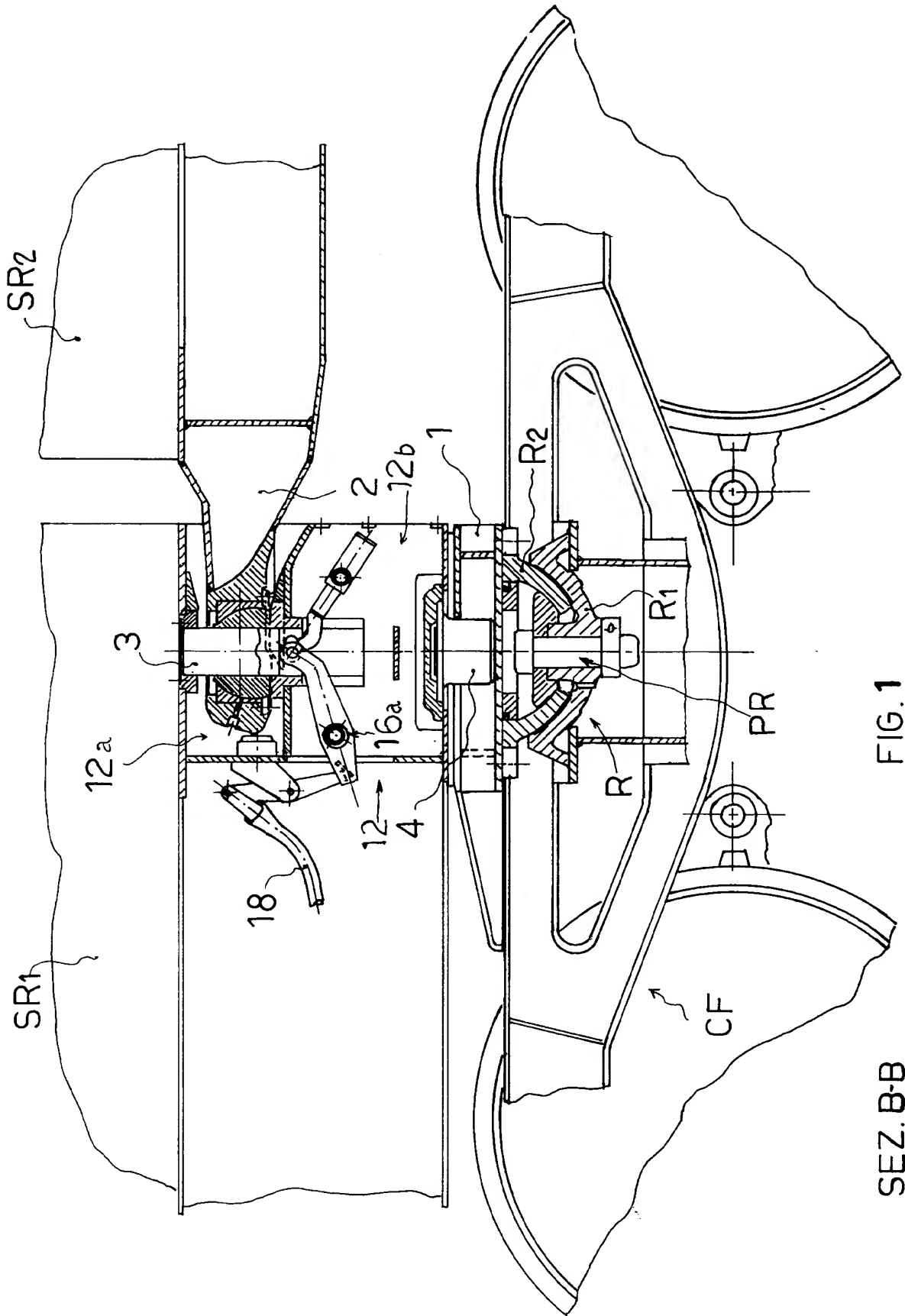
5. System as claimed in claims 1, 2 and 3, characterised by the fact that the casing (12b) which contains the levers, mounted fixedly to the underframe of the semi-trailer, beneath the coupling casing (12a) is shaped at the top so as to form an angled surface (12.1) which fits together with the angled level (13.1) to facilitate the upward sliding of the vertically angled contour (2.1) at the end of the male member (2) or that is towards the inside of section (12a) of the coupling casing.

6. System as claimed in claim 1, characterised by the fact that the means, which at points e) and f) to permit the application to the semi-trailer of the rail bogie CF and of the rail adaptor bogie furnished with buffers and hooks necessary for the insertion of one or more semi-trailers into a rail train, consist in a turn plate applied to a rail bogie CF, by means of a counter fifth wheel (R2) and sliding blocks to allow for the respective coupling with the fifth wheel (R1) and the sliding blocks of the rail bogie, the turn plate of the rail adaptor bogie being rigidly fixed in relation to a framework (34.2) furnished at one end with buffers and couplers and/or other necessary means for the connecting of conventional rail vehicles, and at the other end (34.1) suitable to be locked by means of a limiting plate (35) to the beam of the frame of the semi-trailers, the same turn plate, being able to be turned around the axis of the fifth wheel (R1) of the bogie to permit its application to the corresponding end of the semi-trailer from both ends of the same bogie, when it is not locked to the bogie with the pin (36).

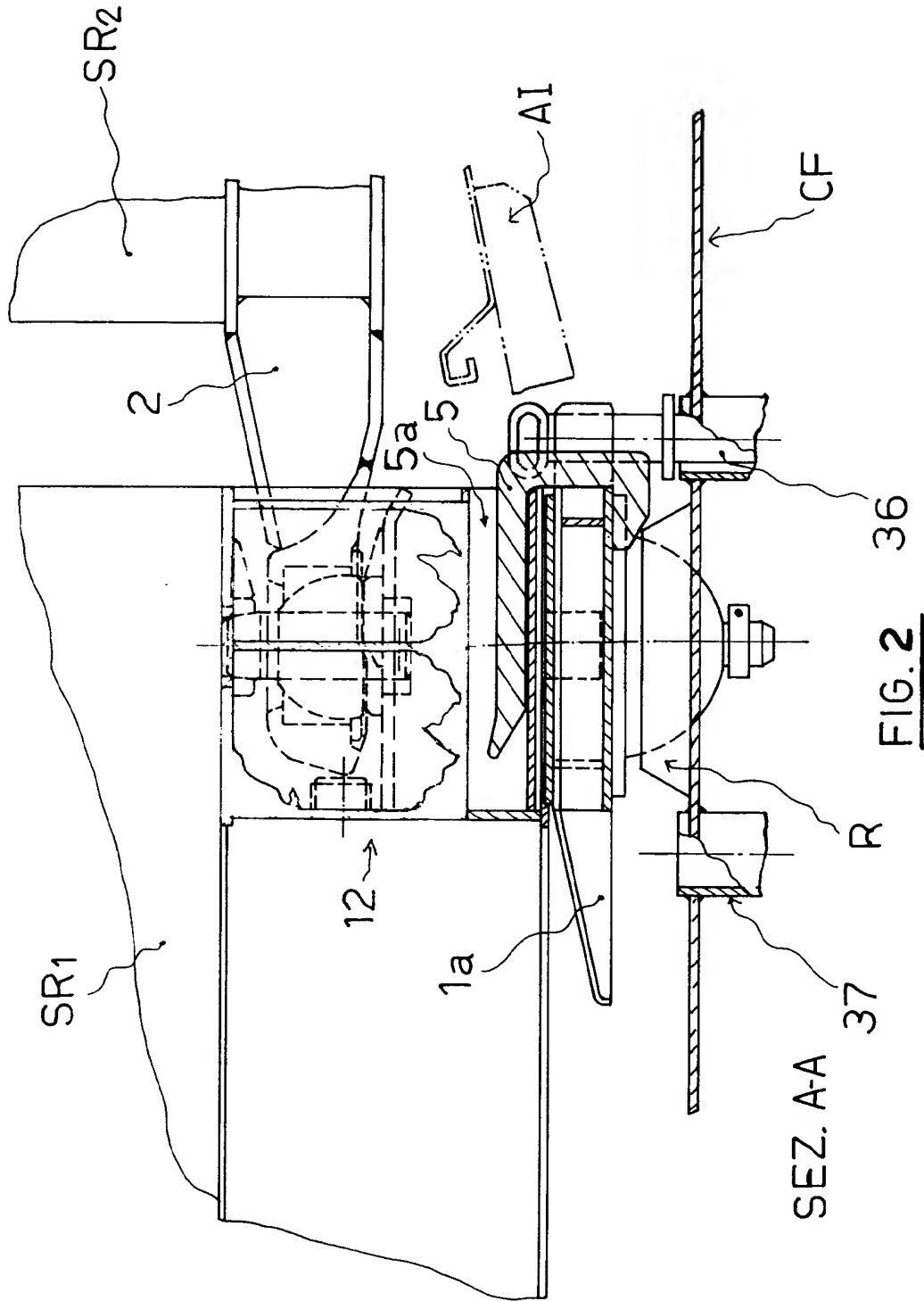
7. System claimed in points e) and f) of claim 1 and in claim 6, characterised by the fact that the coupling means at the rear part of the semi-trailer, of the turn plate, of the rail bogie and of the rail adaptor bogie consist in a triangular opening (1b) of the turn plate into which is inserted a king pin (4) rigidly fixed to the lower surface of the rear cross beam TR of the semi-trailer, the triangular opening being edged by two triangular plates (1a), the connection with the king pin being realised by means of a hook (38) which remains locked by a bolt (38a) which at the same time causes,

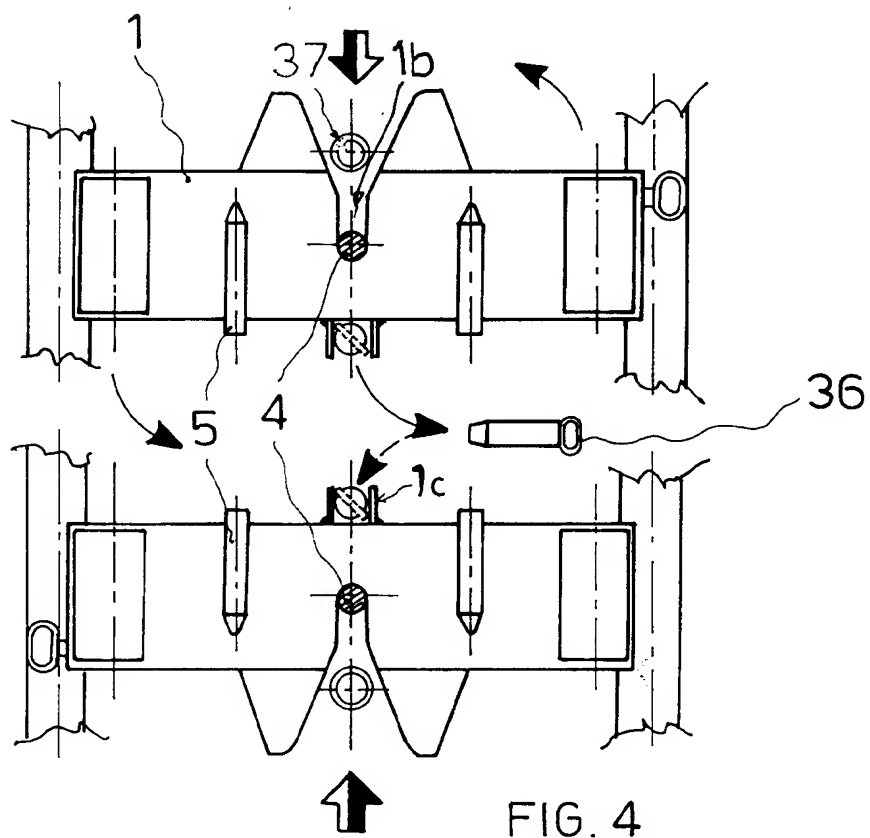
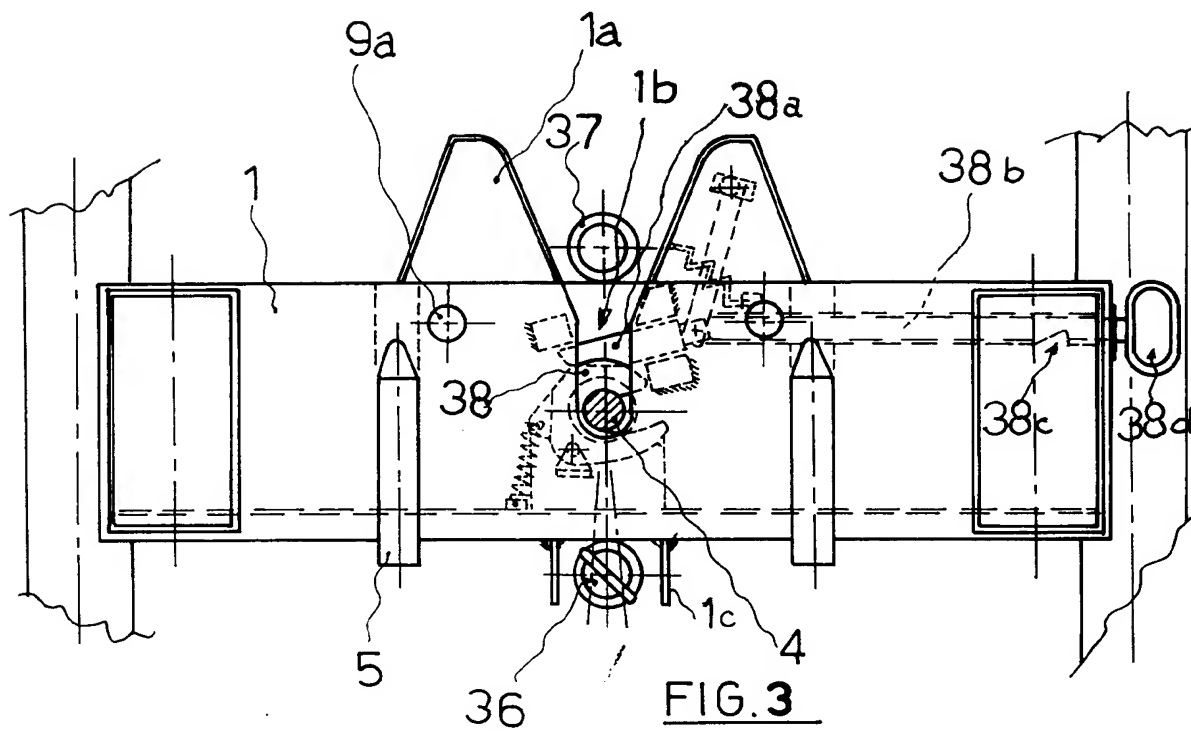
with an end stroke valve (31) the elevation of the wheels of the road bogie by means of the cylinders (24), the turn plate also being furnished with two forks (5) which on penetrating two tubular cavities (5a) whose longitudinal axes are parallel to the longitudinal axis of the semi-trailer, prevent its movement or rotation therein.

8. System as claimed in claim 7, characterised by the fact that the turn plate of the rail bogie is also fastened to the rear cross beam TR of the semi-trailer by means of two pins (9), which are symmetrical in relation to the axis of the king pin (4), which penetrate the two cylindrical holes (9a) of the same turn plate .
9. System as claimed in point f) of claim 1, characterised by the fact that the coupling means mounted onto the turn plate (32) of the front adaptor bogie use the same coupling system between the semi-trailers, or rather consist in a coupling casing (12bis) rigidly fixed at one part to the frame members (32a) of the buffers and at the other part to the frame members (32b) to insert under the front part of the semi-trailer to lock them with two plates at c (33) rigidly fixed to the longitudinal beam members of the semi-trailer, to permit the insertion of the spherical joint of the male member (2) mountend at the front end of the semi-trailer.
10. System as claimed in point e) of claims 1 and 9 respectively, characterized in that the elevation of the end part of the semi-trailer by the suspension of the road bogie, is caused by an end stroke valve (30) actioned by the anti-telescoping back girder when it is rotated upwards and in that the levers (23) and (18) lock the wheels of the road bogie into an elevated position at the level of the rails and fasten the coupling of the turn plate of the rail bogie by means of safety pins (9) the above mentioned levers actioning a hand lever (17) which prevents the clockwise rotation of the lever which extracts the pin (3) from the vertical hole of the spherical joint at the end of the male member (2).









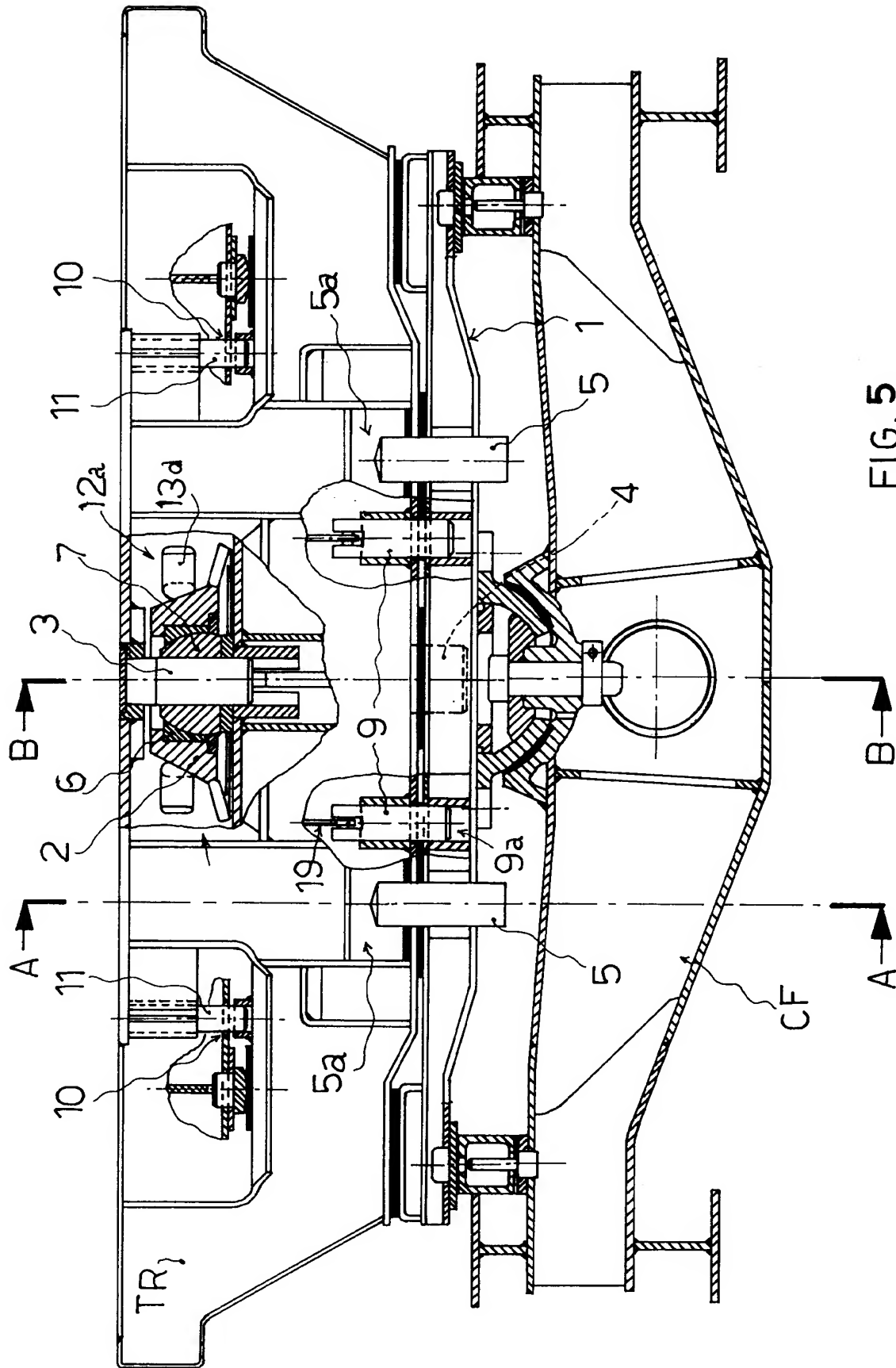


FIG. 5

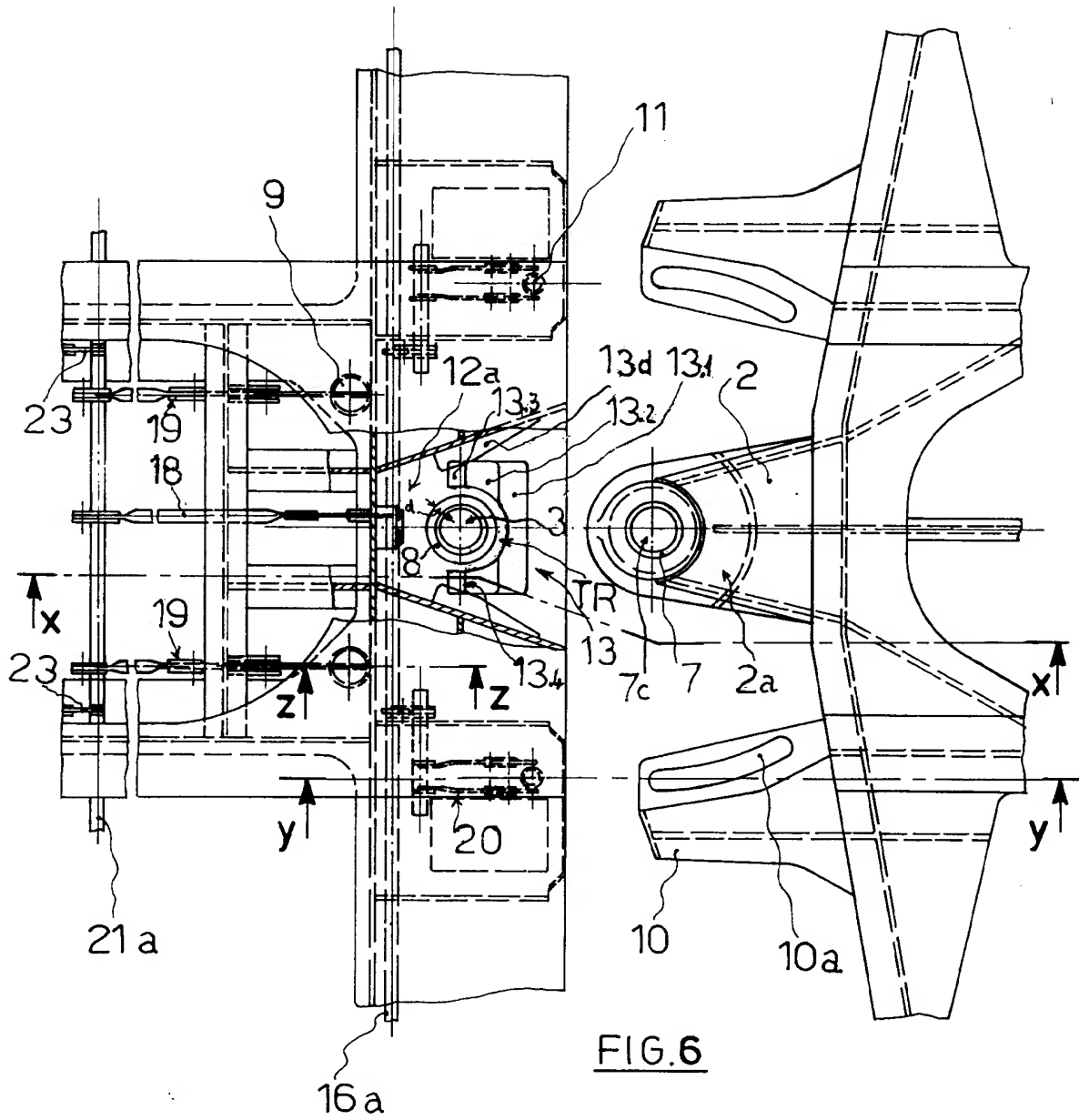


FIG. 6

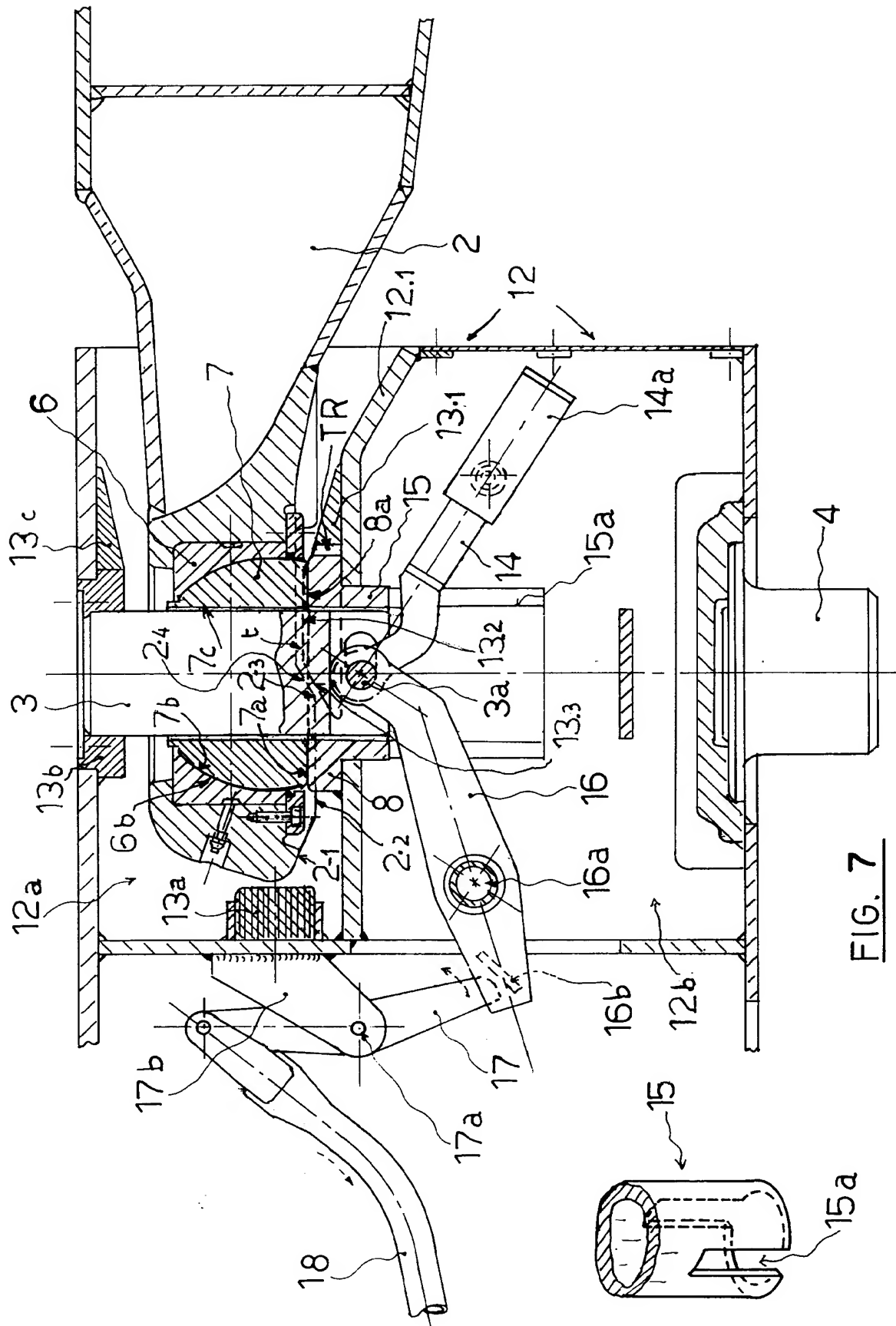
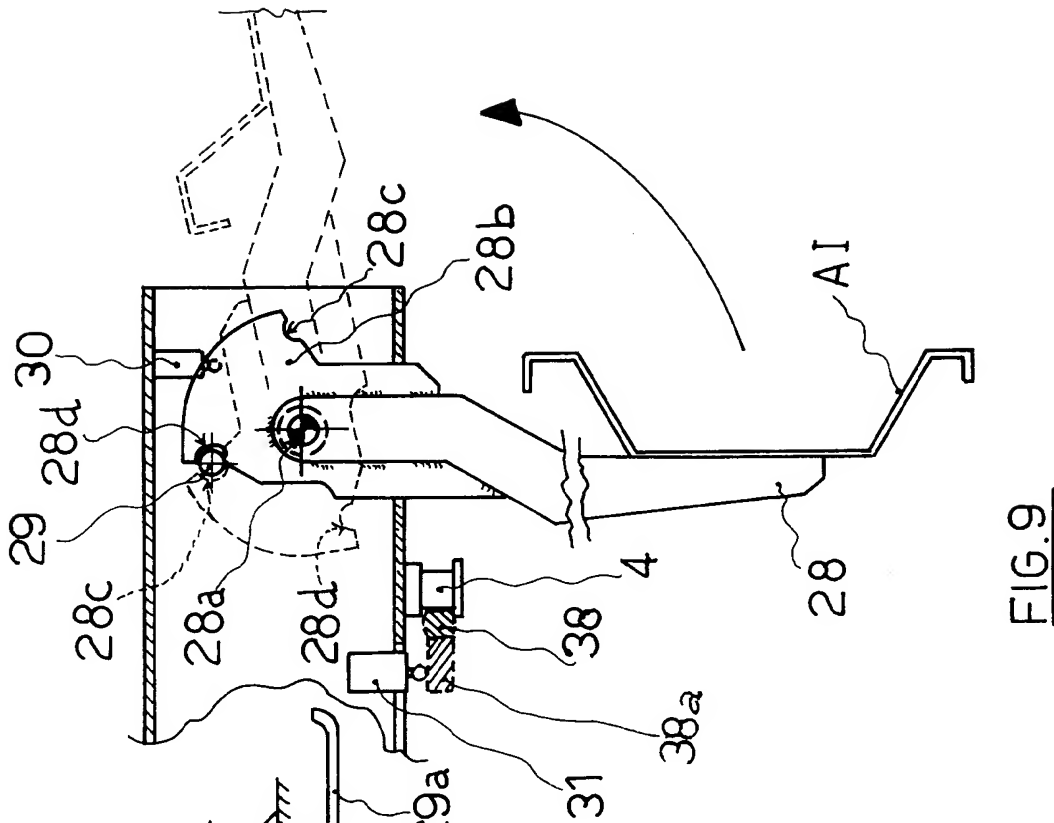
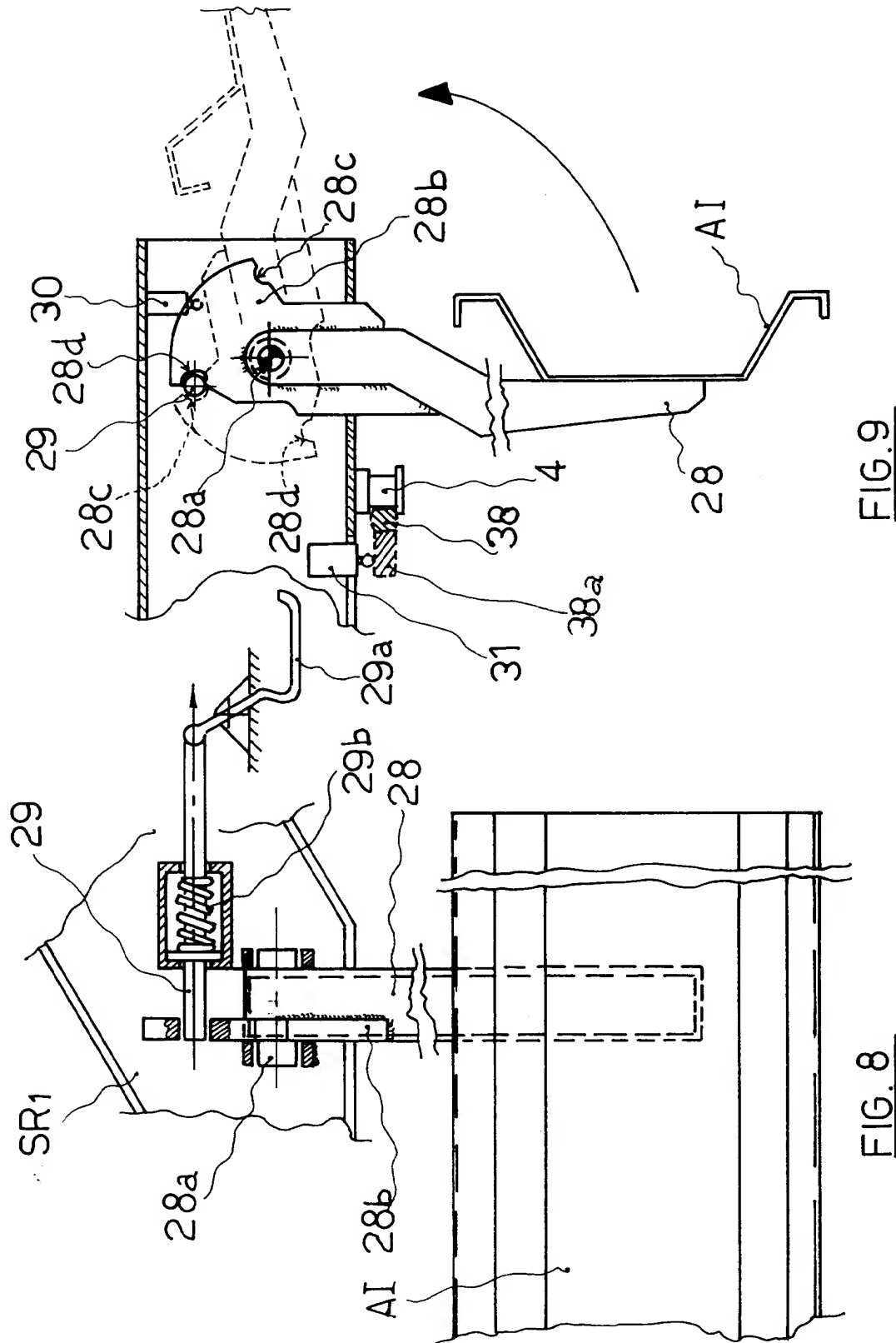
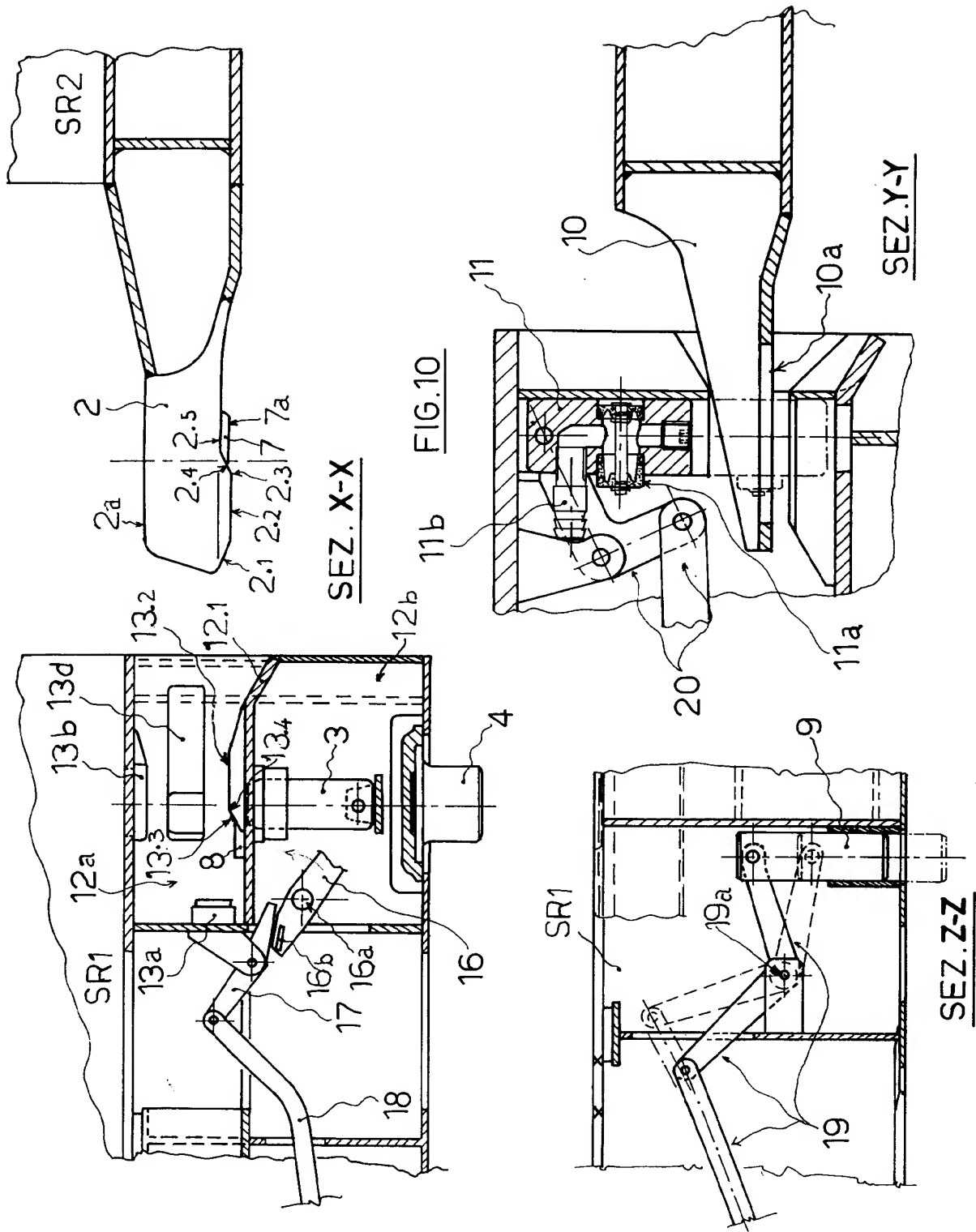
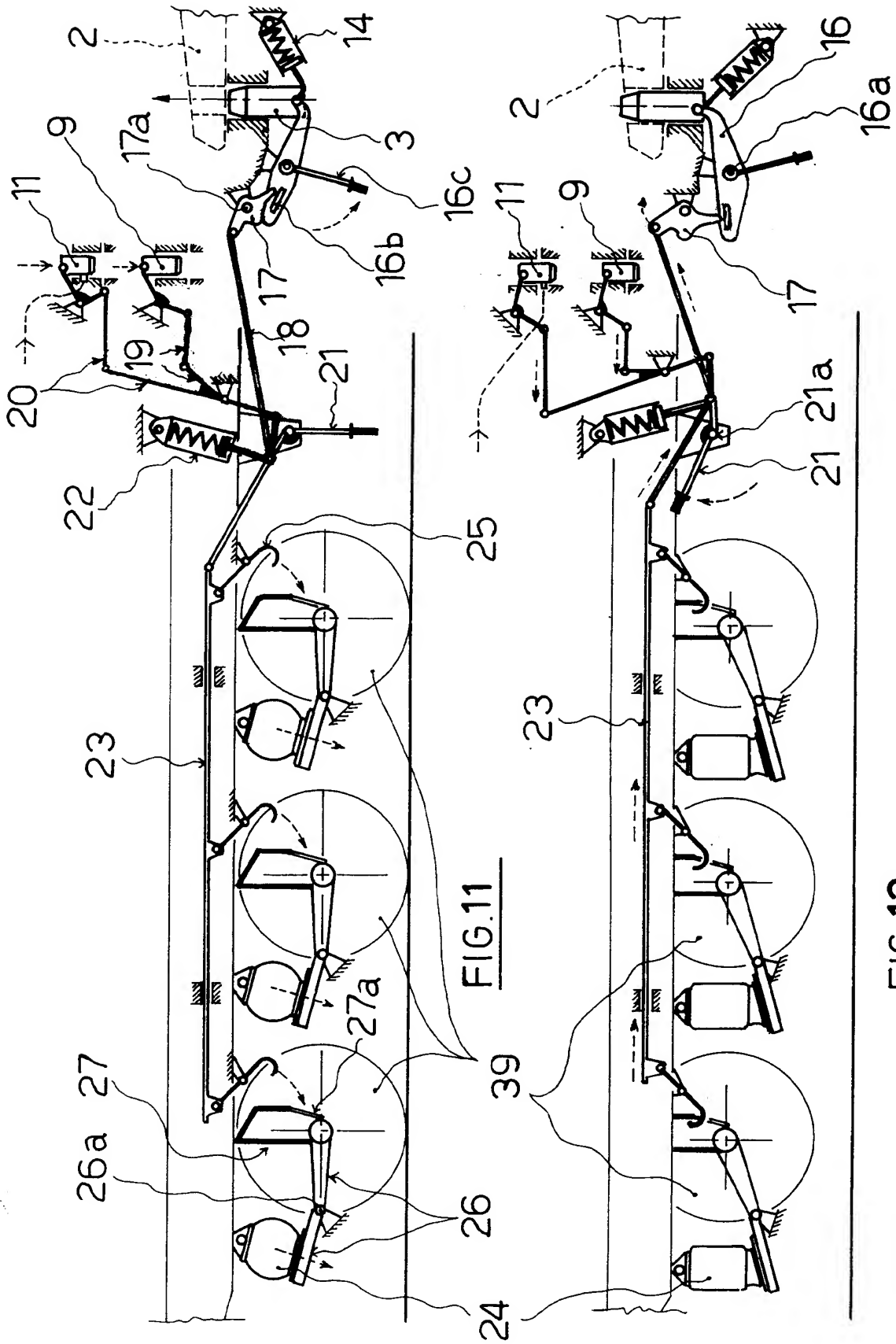


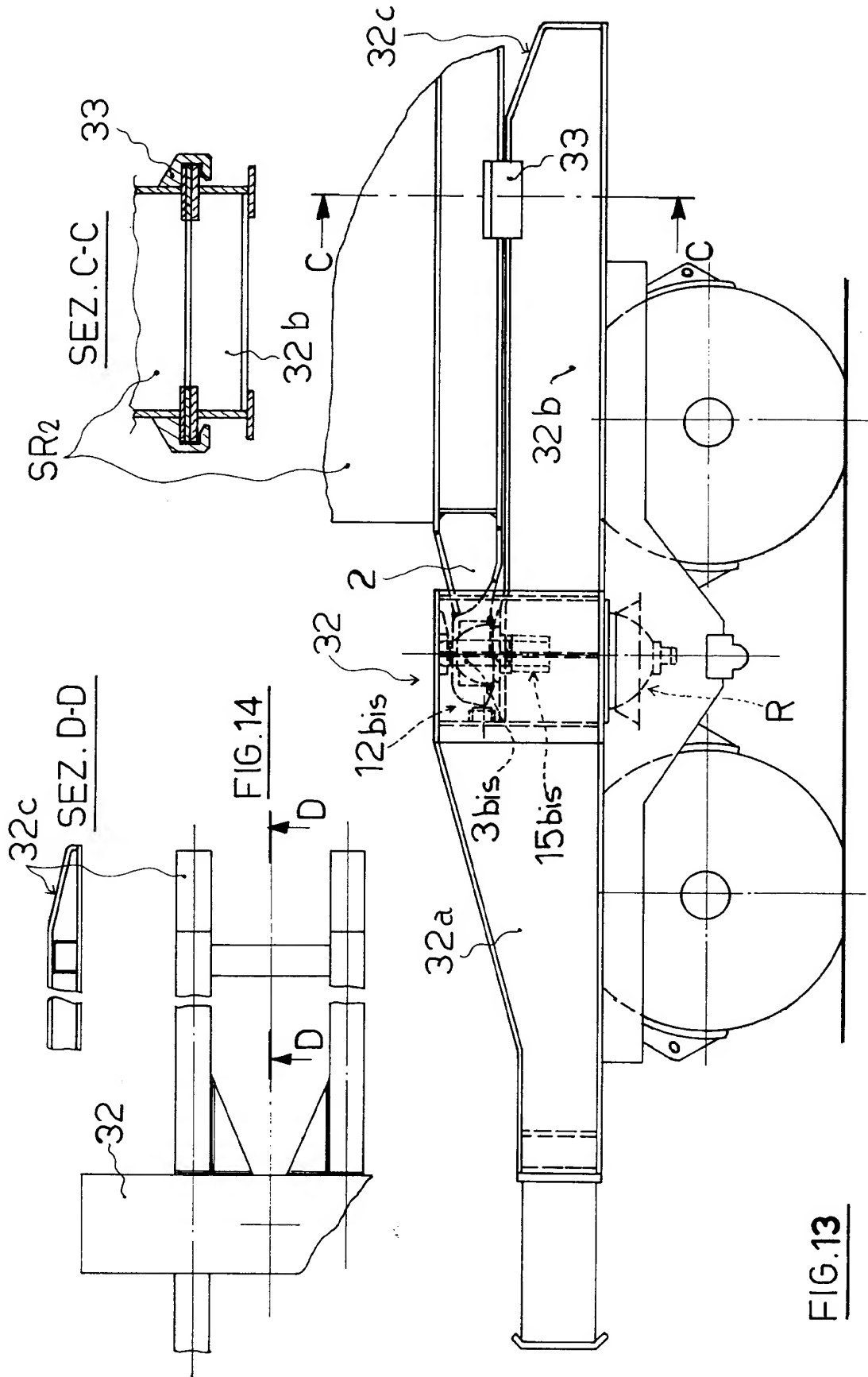
FIG. 7

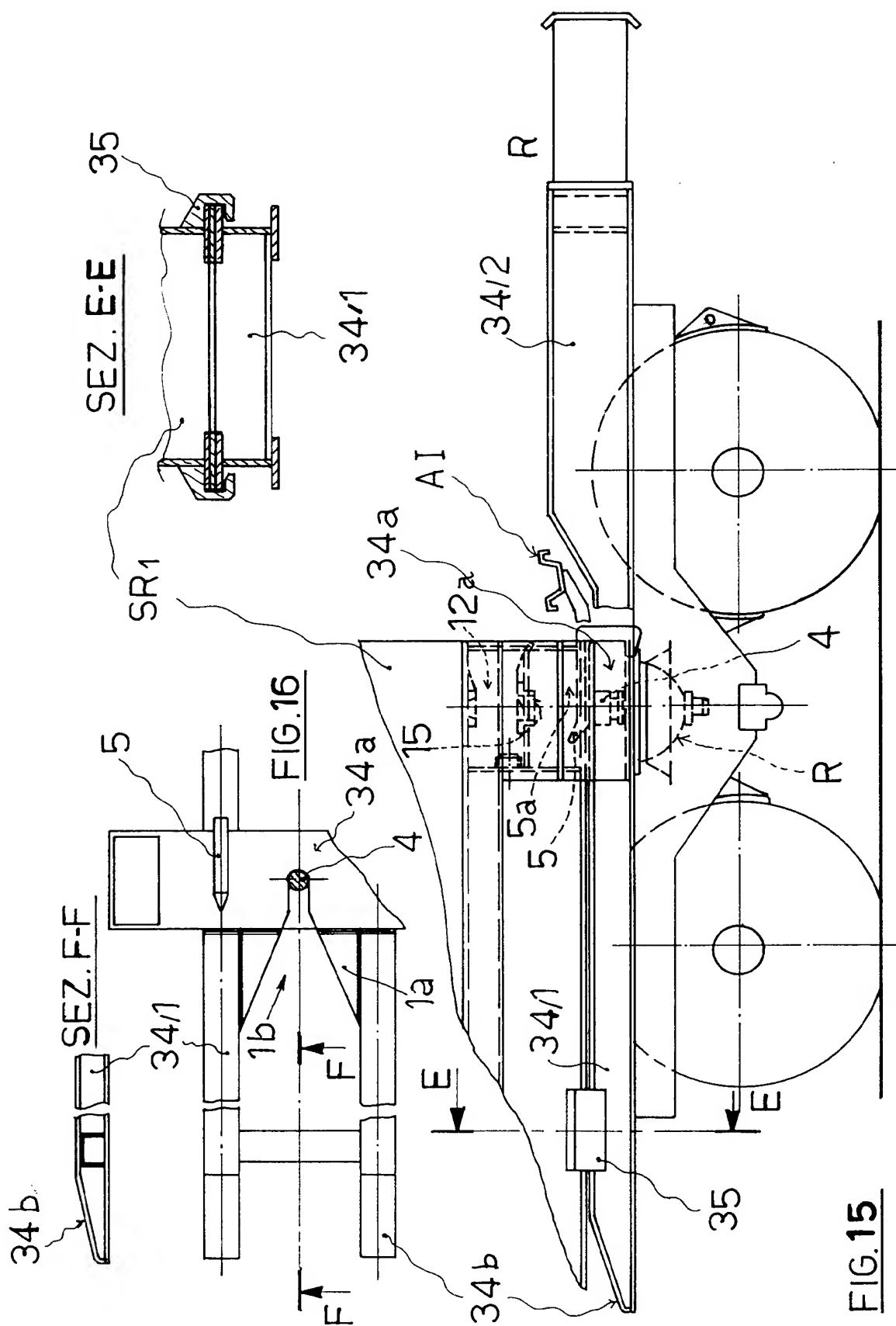














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## EUROPEAN SEARCH REPORT

Application Number

EP 91 10 0136

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	WO-A-8903784 (FERROSUD S. P. A) * page 7, line 4 - page 14, line 24; figures 1-10 *	1, 6-8, 10	B61D3/18 B61D3/12 B61F3/12
A	US-A-4955292 (C. A. CRIPE) * claim 1; figures 1, 2, 10-17 *	1, 10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B61D B61F B60F B61G B62D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03 SEPTEMBER 1991	Examiner CHLOSTA P.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document	